

# **Method of improving incentive spirometry devices by the employment of verbal simulated humanlike voices to encourage usage**

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## **Background Of The Invention**

The present invention relates to enhancement of the Incentive Spirometer Medical Apparatus, through electronic technology to the medical apparatus which is normally used to help in the rehabilitation of the lungs after an operation, or similar type situations. The Incentive Spirometer consist of a plastic bell jar with a float inside the bell that rises, due to air being inhaled through a tube that is attached to the bell jar. By inhaling in the tube, the patient attempts to reach different volumes that are represented on the bell jar, where the float is used as a measuring device, but the float in the bell jar moves slowly and does not remain at it's apogee for very long, making visual accuracy for reading it's measurements on the scale, (on the bell jar), difficult. The purpose of this prior art, is to bring air into the patient's lungs. The more air and use of the device, the better the patient's lungs become and thus the lungs are strengthened, however as recent studies have shown, complications such as pneumonia, are due to the lack of compliance, by the patient. Normally, the patient must utilize this medical apparatus without assistance and is expected to basically read written information on how to use the device, which is often performed improperly. Through the improvement of using electronically simulated, audible, verbal, human sounding word, words, or phrases that emanate from within the Incentive Spirometer itself, the ability of this programmed new invention, has the intelligence to detect the patient's measurements, as well as prompting the exact time, that the patient should begin therapy again accordingly. This new improved apparatus, will also give the measurement of the volume that the patient has performed during their therapy, along with encouraging phrases that continue to lead and guide the patient until the full therapy is completed. Prior art required the patient to do the therapy unsupervised and the present invention will provide verbal instruction and guidance electronically, allowing not only the sighted but the blind to benefit as well, providing a new method of technology in the medical industry.

# **Method of improving incentive spirometry devices by the employment of verbal simulated humanlike voices to encourage usage**

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Date: 3/21/04

## **SPECIFICATION**

Patent application, # 60/458,176, in compliance with the USTPO, gives priority in correlation with the following specification.

The present invention relates to improving upon an apparatus used in the medical industry, which is used to increase transpulmonary pressure and respiratory volumes, improve inspiratory muscle performance, and re-establish the normal pulmonary hyperinflation, utilizing the employment of an audible, verbal, simulated vocalization of a humanlike voice through the use of modern technology, or any process available to accomplish this employment. Since, repeated usage of said medical apparatus on a regular basis allows airway passages to be maintained and lung atelectasis to be prevented or reversed, this new invention will prompt and encourage the patient, through the employment of an audible, verbal, simulated, generated, synthesized, or any similar process that can provide the function to produce humanlike voice, voices, word, words, or phrases, in order to help motivate the patient to use said apparatus. To achieve the function provided by the present invention, as described herein, and being that there are many different components presently available that can be used to facilitate the completion, operation, or function of the present invention, some examples of possible components are: micro chips, micro controllers, integrated circuit controllers, coin cells, power sources, batteries of a variety of sizes, (rechargeable or non-rechargeable), power adapters for direct current power supply for whatever requirements in relationship to any existing country, multiplexor circuits, electrodes, mylar speakers, sound modules, inductors, electro chromium, PC boards, inductive sensory systems, electrolyte layers, voltage regulators, oscillators, or indicators, just to name a few, however, not limited to and the exact components or combination of components will not be described specifically, except when applicable to context in order to simplify the specifications necessary to accomplish, or achieve the concept of the function of the present invention. The present invention

encompasses the entirety of the necessary components for the conception, as herein specified, of the above said medical apparatus, subject to patent allowance, in relationship to the utilization of present, future, new or impending technology, to create the same effect, as described herein as applies to the function of said apparatus, in order to produce audible, verbal, simulated, generated, or prerecorded humanlike voices phrases, or any similar method of providing the same effect, that will supply verbal commands, or responses to the patient, as specified herein. The present invention encompasses the use of humanlike voices, in which a single word, words, or phrases, are produced through the components required for function, as herein stated, whether simulated, generated, prerecorded, synthesized, artificially produced, or any similar process, or combination of components imperative in order to supply the necessary function to facilitate the appropriate use of the present invention, as specified herein, in order to supply a verbal vocalization of a humanlike voice. The function of the present invention, to provide a humanlike voice or sound of an audible, verbal, humanlike word, words, or phrases, or any similar function. The word humanlike does encompass the use of audible, verbal words, or phrases, or a single word that may sound different in a variety of tones, such as a talking or speaking animal, simulated or generated voices, or similar voice animation's, to produce a humanlike sound, as described herein, as animals do not normally speak. So, the variation of sound as specified in the present invention, when relating to the definition of humanlike, as herein pertains, is confined to the characteristic of an audible, verbal, simulated, generated, or synthesized words or a single word, as aforementioned, that sound like human words, encompassing any language in relationship to the function of the above said medical apparatus, as pertains to the present invention.

The word apparatus refers to the use of the Incentive Spirometry device as above mentioned in correlation with the concept of the function of the present invention. The word medical, as herein specified, relates to the apparatus or therapy in which the present invention is being employed in order to benefit the health or condition, or any specialized conditions, in which the patient, person, or persons, using the prescribed therapy pertaining to the apparatus, through said use of said apparatus, can hopefully benefit. The word patient, as herein specified, relates to any, person or persons, utilizing the above said medical apparatus, according to the system of therapy in which the medical apparatus applies in relationship to the present invention in regards to the specification to function as herein described, but not limited to. The accepted name for the above mentioned medical apparatus, which usually only gives incentive to the patient through visual confirmation, is Incentive Spirometry device, also referred to as sustained maximal inspiration (SMI), which is a component of bronchial hygiene therapy. However, to simplify the conception and the specification of the field of the invention, the name of the present invention, shall be known herein and referred to as, Lung Enhancer, which is the combination of any or all parts of whatever equipment or components are needed to provide the function of the present invention as herein mentioned and can also be used separately, utilizing it's own housing, supplying an audible, verbal, response without visual affirmation, as it does not require the housing of the above mentioned medical apparatus, should one desire to eliminate it. The Lung Enhancer can utilize voice chips or modules, as applicable, or any similar device, which in combination, as needed can produce, generate, or synthesize, however, not limited to these exact components can provide a humanlike voice, word, words or phrases will give an audible, verbal response or command to the patient, allowing the patient to obtain the particular goal, predetermined flow rate, or volume of air needed to be inhaled. When the Lung Enhancer is combined with the above said

medical apparatus, or used separately, through the combination of the necessary components, as described herein, the operation of the said medical apparatus can be adjusted, according to the patients goals, to provide verbal responses, or commands, to the patient, in order to encourage usage. Since, utilizing the combination of those components necessary to facilitate the function of the Lung Enhancer, with the above said medical apparatus provides visual and audible incentive, it is obvious that the combination of the Lung Enhancer with the Incentive Spirometry Device, or said medical apparatus is more applicable for fulfilling the maximum functional purpose of the Lung Enhancer, and will be described herein pertaining to such, however, not limited to. Thus, the main purpose of the above said, audible, verbal humanlike voice commands or responses as provided by the Lung Enhancer, is to give incentive to the patient in order to encourage the usage of the apparatus, to improve lung function, and correct the possible problems that may occur without proper therapy, as described herein. In order to provide the Lung Enhancer with the appropriate functions for the apparatus, a microcontroller, but not limited to, can be used to facilitate the different settings that the Lung Enhancer can supply in conjunction with the adequate components to provide an audible, verbal, simulated, generated, synthesized, or any similar process that can provide humanlike, words, or phrases, or a single word to the patient in order to encourage use of the apparatus. The target amount of inhaled volume can be set in the Lung Enhancer so that the patient must reach his or her initial volume prior to the next level of increasement needed, per the therapeutic requirements and the Lung Enhancer will automatically increase the increments of volume required for the patients exercise, thus, the patient will be required to improve their performance and thus, improve their lungs and medical health. With the above mentioned additional benefit, when

the patient reaches his or her particular respiratory inhaled volume, an audible verbal response from the Lung Enhancer will give an immediate indication of whether the volume, volumes, points, ratios, or performances accomplished by the patient, or any similar goal, have been reached through the sound of an audible, verbal, humanlike, simulated, generated, synthesized, or any similar process that will produce a voice, or voices originating from the apparatus itself, by giving the exact measurement and helpful incentive, to encourage the patient to continue to use the apparatus, according to the aforementioned programmable functions. Should the attempted aforementioned programmable, therapeutic goals or volumes fail to be accomplished by the patient, the Lung Enhancer will provide an audible, verbal, simulated, or otherwise produced, as above mentioned, humanlike voice, or phrases which will confirm that the patient has not achieved their goals accordingly, and a corresponding audible, verbal vocalization, as described herein, such as, "try harder" but not limited to, will inform the patient of their particular progress, output, or momentum through a humanlike voice originating from the apparatus itself, as herein described. However, this is not a required addition to the apparatus, but it is covered as part of the invention, in relationship to exploiting the fullness of the complete functional operation of the apparatus, so as to provide the most advantageous benefit to the patient though providing a gauge or similar device, in order to allow the patient to achieve adequate audible, verbal, verification of the patients pre-set goals or achievements. On the other hand, the constructor of the apparatus may desire to avoid the additional cost of components necessary to produce the additional adjustable function and can be avoided if so desired, as the Lung Enhancer can be constructed to only coincide with the visual readings that normally exists on the above said medical apparatus and will solely provide only those exact readings being performed by the patient and the Lung Enhancer shall provide verification of those inhaled volumes, or readings through the audible, verbal, humanlike phrases, as

described herein, without setting any goals, according to the construction of the apparatus. So, the constructor may choose to eliminate the use of allowing the patient to set his or her own settings accordingly. Whether constructing the apparatus with self gauging devices as aforementioned or simply allowing the Lung Enhancer to only audible or verbally speak the ratios or volumes or other readings inhaled by the patient without attempting to reach goals, as aforementioned, both functions allow the blind to benefit as well as the patient with sight, as the blind will be able to hear their inhaled volumes. So, the construction of the above said apparatus is at the discretion of the constructor, and will be based on the function that one desires to fulfill utilizing the Lung Enhancer, A voice chip, or similar unit, constructed within the above mentioned Lung Enhancer can provide humanlike voice phrases that will allow the patient using it to inhale, while at the same time, an audible and verbal response will verify whether the person using the Lung Enhancer has reached their particular goals. This will be achieved through the use of a simulated, generated, synthesized, prerecorded human voice, or anything similar in order to facilitate function, as herein described, (male or female), which can be applied in combination with said apparatus, as aforementioned and the Lung Enhancer will prompt the patient through audible, verbal simulated words or a single word or phrase, to either, "try again", or "good job, you hit your mark", or "great", or any phrase similar, but not limited to, that applies accordingly, in relationship to the particular use that the Lung Enhancer requires at that time, in relationship to function, as described herein. Since, one must inhale to help facilitate the improvement of ones lung capacity and health, as described herein, an air pressure sensor, or similar device, can be installed at the appropriate location on the Lung Enhancer itself, to measure the exact amount of volume being inhaled and relay those accurate readings in synthesis to the appropriate components, in

order to supply audible, verbal verification of said readings as mentioned herein, corresponding to the visual measurements being performed on the apparatus, in order to complete this function of the Lung Enhancer, encouraging or correcting the patient accordingly, with an audible, verbal, simulated humanlike voice, as aforementioned, to give verification of the amount of volume being produced. The above said sensor can be placed at whatever location facilitates the function of the Lung Enhancer as mentioned herein, and should be connected directly to the area in which one is inhaling. Normally, a tube is used to inhale the amount of air the patient is bringing into the lungs, however, the new Lung Enhancer invention is not limited to the physical structure of any apparatus, that is providing the medical function as described herein. Should cost be a consideration, the Lung Enhancer invention can utilize electronic sensors (but not limited to), attached directly to the above said apparatus at each point, in which the air volume is normally visualized by a float which will relay electronic signals, but not limited to, allowing the constructor of the apparatus to eliminate the above said sensor while still allowing the concept of the facilitation of the function of the lung Enhancer, as herein described. This alternative appropriation of components to achieve the same function by eliminating the pressure sensor, as above stated, will still give the completeness of the necessary function as previously described in relationship to the medical apparatus, prompting the patient using the Lung Enhancer to accomplish the goals or requirements of that therapy, in compliance to the apparatus by employing audible, verbal, incentive utilizing simulated, generated, synthesized or any similar process in order to produce humanlike words, or phrases or a single word which encompasses the concept of the embodiment of the present invention, as herein described. A



speaker can be attached to whatever housing, on the aforementioned apparatus, as needed to produce the required audible, verbal sound, as herein described and the Lung Enhancer can have as many audible verbal commands and responses, supplying simulated human voice as desired, according to the output potential employed by the construction of the above said apparatus. Said construction is not contained to any degree herein, as specific ratios and outputs will depend on the application and construction designed to promote the usage of the device and obviously some apparatus may require particular specialization's to provide the audible, verbal simulated human voices as aforementioned and the provider of the apparatus shall maintain the specifications or structure of each unit produced in which the new Lung Enhancer invention is utilized. Another important benefit of the Lung Enhancer, is the ability to install a programmable timer for letting the person manipulating the device to know what time he or she should begin using the apparatus. The aforementioned programmable timer is not necessarily required to fulfill the concept of the Lung Enhancer, however, it is encompassed within the concept of the present invention, so as to achieve the fullness of the complete available functional operation of the apparatus according to the patient's particular need, or therapeutic program, which shall virtually be provided without the use of any assistance, as the normal therapeutic requirement, will be replaced by the use of an audible, verbal, simulated, generate, synthesized human voice, word, words, or phrases, or any similar process as described herein, and this function will be provided by the Lung Enhancer, which will automatically vocalize that it is time for the person or patient to use the apparatus as needed. This will assure the patient is diligent to continue the necessary procedure to

increase respiratory rate as prescribed, as the Lung Enhancer can be adjusted to continue to provoke the patient, through; audible, verbal, simulated human voices, phrases, and reminders that will continue to say audible, verbal, simulated human phrases giving incentive to help encourage the patient, until the patient uses the apparatus, to achieve the patients up-most potential. With a device as important as the aforementioned apparatus, the therapeutic recommended interval for usage of respiratory spirometry devices is normally 1 hour, the Lung Enhancer can provide the doctor or therapist with the ability to set the exact amount of time in correlation with the constructor in order to provide the appropriate functions, between each use so that the patient can be reminded accordingly at that time, through an audible, verbal, humanlike reminder, as described herein, using a word or phrase to accomplish this recommended therapeutic utilization of the apparatus through the operation of an audible, verbal incentive emanating from within the apparatus itself. However, preferably the construction of the apparatus would be more advantageous by pre-setting the therapeutic time intervals prior to making the unit available to the patient, so that the patient cannot change the intervals on their own, thus, preventing any interruption of the the therapeutic session required by the Lung Enhancer. This adjustment of therapeutic time intervals can be pre-set in the unit, so as to make the operation of the present invention as simple as possible and also prevent any tampering with the unit by unauthorized personal. Since the Lung Enhancer, will have a "nag"ability, which means a series of continuous verbal command which prompts the patient until the Lung Enhancer is used appropriately and will be programmed within the housing of the Lung Enhancer itself. The aforementioned

“nag” program function of the present invention will give incentive for the patient to use it; such as an audible, verbal command saying; “pick the unit up”, or verbal incentive coming directly from the Lung Enhancer itself, saying a phrase such as: “it is now time for the exercise program”, but not limited to these exact commands. A sleep mode can be programmed in the Lung Enhancer, which will allow the Lung Enhancer to basically stop working, or take a break, or turn back on, to perform the appropriate function, such as when to begin the therapeutic sessions again like, “time for your therapy”, but not limited to, in order to save battery life and/or the power source and can be programmed within the housing of the Lung Enhancer. Another way of programming the Lung Enhancer, to shut off or on, at any time and/or during the sleeping period of the patient, is by utilizing a card or key, but not limited to this exact principle, made of whatever material facilitates the function, on the apparatus itself, but not limited to, according to the construction per the constructor’s design, at whatever location deemed necessary, to achieve said function and can be slid or slid out, to turn the unit on or off, but not limited to, by providing conductivity at the point of origin when inserted, and this shall be known herein as “slip chip”. Removing the slip chip permanently, never allowing the conductivity to be resumed, would avoid any tampering of this most advantageous aspect of the slip chip which is the continuation of the therapeutic performance of the Lung Enhancer. Another way of facilitating the turn off, turn on ability of the Lung Enhancer would be through the use of light photosensors installed in the unit itself, such as; IPC81X (Daylight sensor), but not limited to this particular component, which shall perform the duties of turning off the Lung Enhancer during the night, by sensing the absence of light, (darkness), or lack of light and thus, turning the Lung Enhancer back on when light is present. With this in mind, the

Lung Enhancer will continue to perform its operation and function throughout the day, or as constructed according to the requirements of the therapist and will allow the patient to sleep during the period when light is not sensed by the sensor in the Lung Enhancer. The embodiment and descriptions to follow, will use gauging of the Lung Enhancer, through the utilization of the float mechanism within the bell jar of the apparatus, in order to provide the most cost effective and advantageous method to perform the function of the present invention, with conductivity. With this in mind, one must have knowledge of the basic construction of the Incentive Spirometer to understand the electronic improvements and enhancements described herein. With this understanding the Incentive Spirometer comprises of a plastic bell jar with a mechanical float, that rises due to air being inhaled by the person or patient through an attached tube. At the same time, the air (patient's breath), flowing out of the bell jar, when the apparatus is being used, causes the mechanical float in the bell jar to rise, such that the position of the float is relative to the volumetric pressure printed on the bell jar, which accurately reflects the amount of air inhaled. The float in the bell jar moves slowly but does not remain at it's apogee for very long and makes visual accuracy for reading it's position measurements on the scale (on the bell jar), difficult. One application for allowing the float mechanism in the Lung Enhancer, is to relay the measurement of the float positioning in correlation, with the numerical positions on the bell jar cylinder, (which encompasses the float). It is obvious that both the bell jar and the float must have conductive material on them, of whatever conductive material is appropriate to facilitate the function of the present invention, by whatever means is deemed by the constructor of the apparatus. A cylinder sensor strip within the housing of the unit, in correlation with the numerical measurements on the bell jar of the Lung Enhancer's housing, but not limited to, would allow the float and said conductive sensor strip, to adjacently touch, to relay correspondence to the appropriate components.

To supply conductivity for said movable float, with the understanding that the preferred method of providing conductivity, for either of the above mentioned float, or conductive sensor strip, could be plating, but not limited to this exact way of supplying conductivity, each above said units with conductive materials such as aluminum, nickel, copper, or gold, or any conductive material that would facilitate the function of the present invention, can be used to relay the electric conducted signal, to the appropriate source, to provide the function of the Lung Enhancer accordingly, as herein specified, for a more accurate reading, through the the above said conductive ability. Another medical application, of the Lung Enhancer, utilizing existing technology as needed, but not limited to, is the ability to insert a data chip or any similar data retaining device or system, to provide information on the usage being performed by the patient. This unit that will transmit or receive data, located in the Lung Enhancer, allowing the therapist or doctor to examine the stored information, whether wireless or by other means, at such time that is deemed necessary. This said data can be retrieved, by removing the data retained on a chip, but not limited to, within the housing of the Lung Enhancer and by inserting a chip or similar unit that applies to data storage, into a PC board, (Computer), that is programmed to provide patient data, that is being retrieved at that time. An alternative answer to retrieving patient data usage, from the Lung Enhancer would be via, infa red, radio waves or similar systems, without the use of any data chips or systems, which will allow transmittal or receiving of data accordingly, from the medical apparatus which will provide the same aforementioned function and shall directly be sent to the PC, or any similar devices such as a hand held unit, similar to a palm pilot, for example an IR 1 FAIRCHILD QED233-ND Transmitter / Receiver, but not limited to these particular

components, in order to retrieve or transmit data, from whatever location which is in appropriate range, in order to receive the aforementioned transmitted retrievable signal, that the doctor or therapist is located at any given time. This non-attached unit, would give the therapist or doctor the ability to retain and retrieve the particular patient's data as needed and have a complete breakdown of information of the amount of sessions, measurements, and information on stored data, necessary to properly treat the patient from another location, as deemed by the doctor or therapist, at any time desired. A code, but not limited to, or similar way of specifying the particular patient, in which data is being retrieved, could simply be entered into the CP, or similar unit, but not limited to, allowing the doctor or therapist to designate which patient he or she is desiring medical information on at that time. This will reduce the valuable time spent, reading charts, or writing information for the doctor to view at a later time. The PC, or similar unit as described as herein, but not limited to, can be at any location deemed accordingly, making the retrieval of data simple and easily obtained. Through the use of the Lung Enhancer, not only will the Medical Industry benefit with this new improved incentive spirometry device, supplying an audible, verbal simulated human voice, which will inform the patient, that it is time for their therapy, what is their progress or volumes reached, when to try again or when to stop, but also the patient as well, for it is well known in the medical industry, "the more one uses the prescribed treatment, the faster one recuperates". With the conception of the Lung Enhancer, a new step in medical progress will be made through a cost effective electronically enhanced new device, that guides the patient from start to finish, as well as prompts, nags, goes into "sleep mode", and wakes up to encourages usage. The use of an audible apparatus that gives information, or the ability to

retrieve stored information data, is invaluable and will allow the patient to recover quicker, as well as, save money by providing a way to prescribe the proper treatment to those patients more effectively and comprehensively. Thus, by using the Lung Enhancer, quicker patient recovery will be achieved, through compliance, with less complications. Through the utilization of the present invention employing audible, verbal incentive, prompting the usage by the patient, through encouraging words and phrases, produced by the medical apparatus itself will not only benefit the sighted, but the blind as well, providing a more useful method to assure adequate recovery.